Advisory Council on Science and Technology

Conseil consultatif des sciences et de la technologie

SUPPORTING DOCUMENT 10 EXECUTIVE SUMMARY

Monitoring Critical Skills

Prepared for the Expert Panel on Skills
by Margaret Roberts

February 1999

Canada

Executive Summary
Monitoring Critical Skills

Margaret Roberts

Purpose of Study

To address the question of whether or not Canada has the reliable means, on an on-going basis, for defining, measuring, monitoring, and predicting critical requirements in strategic sectors such as aerospace, automotive, biotechnology, information and communications technologies, and environment.

Highlights

Data Sources

The critical skills listed were identified from a review of the Sector profiles developed for the Expert Panel on Skills. These industry profiles provide summaries of the human resource issues and concerns of each industry, including information from secondary sources on reports of specific skill and occupation requirements.

Limits of Monitoring Systems

Monitoring systems such as occupational and industry classifications do not directly capture skills. Monitoring systems are designed to collect data and measure change, but change at a macro level.

Skills data is very detailed and requires specialized data collection and analysis methods. Canada's monitoring systems do not deliver skills information.

Some indirect skills information can be derived by using proxies such as occupation, industry, and field or level of education.

There is no common framework or language of skills to define, measure or relate them to one another or to support the collection of data. HRDC's work in the development of the Skill Profiles (the foundation of Electronic Labour Exchange or ELE) and Essential Skills provide a starting point.

Skill-Based Systems

HRDC Skill Profiles and Essential Skills are both skill-based systems. They have been developed for the purpose of identifying skills in the workplace. They have much to contribute to any ongoing discussion and development of skill-based information systems.

Lack of Skills Information

- Very little information about the development and supply of skills is available from any of the sources reviewed. This absence of skills information seems to be uniform, applying to the five sectors under review as well as all others.

Limits of Skills Information

- The collection and analysis of skills information is time consuming and expensive. It does not lend itself to large household surveys, and surveys of establishments might provide an appropriate venue but they are notoriously difficult to implement.

Preferred Method of Data Collection

- Since universal coverage of all skills in the economy is not likely required, special job analysis studies or surveys using a standard language and methodology probably provide the best means to collect skills information.

Observations

- Canada has not gone as far as some other jurisdictions (especially the UK) on efforts to describe, catalogue, and measure attainment of various skills and proficiencies.

- Given the expense and difficulty of collecting data on specific skills in demand by employers, what benefits would accrue from and investment in enhancing these systems?

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La mesure des compétences essentielles

Préparé pour le Groupe d'experts sur les compétences
par Margaret Roberts

Février 1999

Canada

Systèmes axés sur les compétences

- Les Profils de compétences et les Compétences essentielles de DRHC sont deux systèmes axés sur les compétences. Ils ont été conçus afin de dégager les compétences en milieu de travail. Ils peuvent grandement contribuer aux analyses permanentes et à l'élaboration de systèmes d'information axés sur les compétences.

Manque d'information sur les compétences

- Les sources consultées fournissent très peu d'information sur le développement et l'offre de compétences. Cette absence d'information sur les compétences semble généralisée et s'appliquer aux cinq secteurs examinés ainsi qu'à tous les autres.

Limites de l'information sur les compétences

- La collecte et l'analyse de renseignements sur les compétences prennent beaucoup de temps et coûtent cher. Elles ne se prêtent pas à de grandes enquêtes auprès des ménages. Des enquêtes dans les établissement pourraient constituer une meilleure solution, mais il est bien connu qu'elles sont difficiles à réaliser.

Méthode préférée de collecte des données

- Étant donné qu'une couverture universelle de toutes les compétences de l'économie n'est probablement pas nécessaire, des études ou des enquêtes spéciales d'analyse des emplois reposant sur une terminologie et une méthodologie uniformes sont probablement la meilleure façon de collecter de l'information sur les compétences.

Observations

- Le Canada n'est pas allé aussi loin que certains autres pays (surtout le Royaume-Uni) pour tenter de décrire, cataloguer et mesurer diverses compétences et habiletés.

- Étant donné le coût et la difficulté de collecter des données sur des compétences particulières recherchées par les employeurs, quels seraient les avantages d'un investissement destiné à améliorer ces systèmes?

Sommaire

Le suivi des compétences essentielles (Monitoring Critical Skills)

Margaret Roberts

Objet de l'étude

Déterminer si le Canada possède des moyens fiables et permanents de définir, mesurer, suivre et prévoir les compétences essentielles nécessaires dans des secteurs stratégiques comme l'aérospatiale, l'automobile, la biotechnologie, l'information et des télécommunications, et l'environnement.

Faits saillants

Sources des données

Les compétences essentielles ont été dégagées à partir d'un examen des profils sectoriels établis pour le Groupe d'experts sur les compétences. Ces profils résument les questions et préoccupations relatives aux ressources humaines dans chaque industrie, y compris des renseignements de sources secondaires sur les exigences propres à certaines compétences et professions.

Limites des systèmes de suivi

Les systèmes de suivi tels que les classifications par profession et par industrie ne portent pas directement sur les compétences. Ils visent à collecter des données et à mesurer le changement, mais le changement au macro-niveau.

Les données sur les compétences sont très détaillées et exigent des méthodes spécialisées de collecte et d'analyse des données. Les systèmes de suivi du Canada ne fournissent pas de renseignements sur les compétences.

Certains renseignements indirects peuvent être obtenus à l'aide d'indicateurs comme la profession, l'industrie et la discipline ou le niveau d'études.

Il n'y a pas de terminologie ni de cadre de compétences communs pour définir, mesurer ou relier les compétences entre elles ou pour appuyer la collecte de données. Les travaux de DRHC relatifs à l'élaboration des Profils de compétences (le fondement du Système de placement électronique ou SPE) et les Compétences essentielles constituent un point de départ.

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Executive Summary

Introduction

The Monitoring Systems paper seeks to address the question, "Does Canada have reliable means, on an on-going basis for defining, measuring, monitoring, and predicting critical requirements in strategic sectors such as Aerospace, Automotive, Biotechnology, Informatics and Telecommunication, and Environment?" The work undertaken included investigation of the following areas

Monitoring Infrastructure

Standard systems of classification provide the common foundation for economic, educational and labour market statistics gathered from a variety of sources. The standard systems most relevant for monitoring Critical Skills were reviewed. Included were the National Occupational Classification (NOC), the Standard Occupational Classification (80), the Standard Industrial Classification (SIC), the Fields of Study (FOS) and Major Surveys of Statistics Canada

Mapping of Critical Skills to Existing Classification Systems

The critical skills listed were identified from a review of the Sector profiles developed for the Expert Panel on Skills. These industry profiles provide summaries of the human resource issues and concerns of each industry. These concerns include reports of specific skill and occupation requirements.

There are limitations inherent in the methodology employed to collect the skill-based information:

- The skills were developed on the basis of secondary sources, not from the people actually responsible for the work such as hands on managers.
- A standardized methodology and 'language of skills' has not been developed for data collection so it is not possible to compare items between sectors or even between respondents with any great certainty.
- Without a systematic data collection methodology, there is no way of knowing if this list is comprehensive.

Nevertheless, the sector profiles provide us with a series of knowledges, occupations with specific skill requirements, cross-occupational skill and knowledge requirements and generic skills. Couched in the common language used for discussing skill requirements, they serve as proxies for skill clusters.

These elements were then related to the NOC, the SOC80 and the FOS.

Information Systems positioned within the NOC Framework

In this phase of the project we looked at information systems which are linked to the NOC . These systems are linked to the data and monitoring systems outlined above and also to each other. In this sense, Canada has a very well developed system of occupational infrastructure. The NOC provides a common framework, within which it is possible to explore a diverse set of occupational-related elements. These include the following:

- Skill Profiles
- Essential Skills
- Worker Ratings (e.g. Aptitudes, interests, data, people, things, etc.)
- Job Futures
- Provincial and local labour market information (LMI)

Private-Sector Sources of Skills Data

A brief review was undertaken to determine the type of information available from four types of private sources; internet recruitment web sites, professional and industry associations, newspaper advertisements and professional recruitment agencies. By no means providing a comprehensive. view, it does provide a glimpse of methodologies employed and the kind of information that is likely to be available.

Conclusions

- Monitoring systems such as occupational and industry classifications do not directly capture skills. Monitoring systems[1] are designed to collect data and measure change, but change at a macro level.

- Skills data is very detailed and requires specialized data collection and analysis methods. Canada's monitoring systems do not deliver skills information.

- Some indirect skills information can be derived by using proxies such as occupation, industry and field or level of education in the analysis of data.

- There is no common framework or language of skills to define, measure or relate them to one another or to support the collection of data. HRDC's work in the development of the Skill Profiles (the foundation of ELE) and Essential Skills provide a starting point.

[1] Canadian monitoring systems are very rich by international standards: the classifications are up to date, numerous very rich surveys collect labour market information which in turn provide an abundance of occupational, educational and industry information, some of which is useful in the pursuit of skills[1].

- HRDC's Skill Profiles and Essential Skills are both skill-based systems. They have been developed for the purpose of identifying skills in the workplace. They have much to contribute to any ongoing discussion and development of skill-based information systems.

- There is no standard methodology by which to collect skills information. Most studies attempting to collect skills information have open- ended questions or provide respondents with an ad hoc list of skills. Comparability between studies is not possible.

- Very little information about skills is available from any of the sources reviewed. This absence of skills information seems to be uniform. It does not have sectoral implications

- The collection and analysis of skills information is time consuming and expensive. It does not lend itself to large household surveys. Surveys of establishments might be more appropriate but are notoriously difficult to implement. Since universal coverage of all skills in the economy is not likely required, special surveys using a standard language and methodology probably provide the best means to collect skills information.

Monitoring of Critical Skills

Introduction - Project Overview

The Monitoring Systems paper seeks to address the question, "Does Canada have reliable means, on an on-going basis for defining, measuring, monitoring, and predicting critical requirements in strategic sectors such as Aerospace, Automotive, Biotechnology, Informatics and Telecommunication, and Environment?" The work undertaken on the monitoring systems is outlined below.

The Monitoring Systems

This phase of the work included the following:

- An overview of the principles and major features of the NOC.
- An overview of SOC80.
- Inclusion of a note previously prepared for the Expert Panel on SIC as it relates to the five sectors.
- A summary of issues related to Field of Study
- A review of the major monitoring surveys conducted by Statistics Canada. including the Census of Population, the Labour Force Survey and the National Graduate Survey
- Review of the implications of Statistics Canada's replacement of the Standard Industrial Classification (1980) by North American Industrial Classification System (NAICS)
- Review of the implications of Statistics Canada's replacement of the Field of Study Codes with the Classification of Instruction Programs (1990)
- Brief overview of new developments at Statistics Canada regarding industry and field of study classifications

Mapping of Critical Skills to Monitoring Systems

This phase of the work included the following:

- A review of the nature of the skills identified.
- A list of skill and knowledge elements deemed to represent critical skills were derived from the five Sector Profiles and validated with the authors of the Sector Profiles.
- The list was mapped to the National Occupational Classification (NOC), the Standard Occupational Classification (SOC80) and the Field the Study (FOS).
- In the instances of combinations of skills or disciplines, mapping was not attempted.
- In the case of generic skills, some were mapped to Human Resources Development Canada's "Essential Skills".
- A set of tables identifying these cross-references has been produced for the Expert Panel and other researchers.
- An assessment of the applicability of the monitoring systems to critical skills.

Information Systems positioned within the NOC Framework

This phase included the following:

- Overview of the Skill Profiles found in HRDC's Electronic Labour Exchange;
- Review of the Skill Profiles developed for the Essential Skills Project;
- Review of data and labour market information available from COPS and Job Futures;
- Review of a sample of provincial labour market information;
- Review of work in other areas such as occupational standards and career information;
- An assessment of the applicability of these systems to the monitoring of critical skills.

Assessment of Effectiveness of Non-NOC Labour Market Indicators

The work in this section included the following:

- A review of internet recruitment systems;
- An investigation of the degree to which professional and industry associations maintain statistics on their membership;
- A review of other private sector sources of information;
- An assessment of the applicability of these systems to the monitoring of critical skills.

Monitoring Infrastructure

Standard systems of classification provide the common foundation for economic, educational and labour market statistics gathered from a variety of sources. The standard systems most relevant for monitoring Critical Skills are described below.

The National Occupational Classification (NOC) and the Standard Occupational Classification (SOC 91)

The NOC was introduced in the 1991 Census. It is a new classification of occupations, the first in Canada to recognize the skill based nature of the world of work. It is used by Human Resources Development Canada, (HRDC), as well as the provinces as the standard framework for the collection and presentation of occupational statistics and labour market information.

The content of the corresponding Statistics Canada version (SOC91) is identical with a few well-documented differences at both the four-digit level of classification. The classification structure is substantially different, with SOC91 being based on skill type alone.

The NOC classifies more than 25,000 job titles in the Canadian labour market. These jobs are categorized into three levels: 26 major groups, 139 minor groups and 522 unit groups.

The 26 major groups are identified by two-digit numbers. The 139 minor groups are identified by three-digit numbers. These groups, in turn, are further broken down into four-digit unit groups. In this study, 4-digit NOC groups were identified for critical skill elements.

The 522 unit groups, identified by four-digit numbers, provide the detailed information found in the NOC. Each unit group has information on employers, examples of occupational titles, main duties, employment requirements and any pertinent additional information.

The NOC groups at all levels of aggregation were designed on the principles of skill type and skill level. Inter-occupational mobility and industry were also a design criterion.

In the NOC, skill type is broadly defined as type of work. It can be a function (management, clerical, sales) or a subject matter, (science, health, social science, culture, skilled trade) or industry (primary industry, manufacturing). The element believed to best represent the "sense" of the occupational cluster was chosen as its defining element. It is partly in this sense that the NOC is seen as a skill based occupational system.

NOC Skill Types:

1. Management
2. Business, Finance & Administration
3. Natural and Applied Science, and Related Occupations
4. Health Occupations
5. Occupations in Social Science, Education, Government Service and Religion
6. Occupations in Art, Culture, Recreation and Sport
7. Sales and Service
8. Trades, Transport Equipment Operation
9. Occupations unique to Primary Industry
10. Occupations unique to processing, manufacturing, and utilities

There are four skill levels in the NOC. Each major, minor and unit group is assigned to a skill level. Skill level in the NOC is defined as the amount and type of education and training required to enter and perform the duties of an occupation. In determining the skill level, the experience required for entry and the complexity and responsibilities typical of an occupation were also considered.

NOC Skill Level Criteria

Education/Training	Other
Skill Level A • - University degree (bachelor's, master's or post-graduate)	
Skill Level B • Two to three years of post-secondary education at community college, institute of technology or CEGEP or • two to four years of apprenticeship training or • three to four years of secondary school and more than two years of on-the-job training, training courses or specific work experience	• Occupations with supervisory responsibilities are assigned to Skill Level B • Occupations with significant health and safety responsibilities (e.g., fire fighters, police officers) are assigned to Skill Level B
Skill Level C • One to four years of secondary school education • Up to two years of on-the job training, training courses or specific work experience	
Skill Level D • Up to two years of secondary school and short work demonstration or on-the job training	

The NOC Matrix provides an overview of the classification at the minor group level. It illustrates how the NOC is accessible on the basis of skill level, skill type, or a combination of these two criteria.

The tables in the previous section map the Critical Skills into this occupational structure. They are concentrated in a very few Major Groups:

- Major Group 01-09 - Middle and Other Managers
- Major Group 21 - Professional Occupations in Natural and Applied Science
- Major Group 22 – Technical Occupations Related to Natural and Applied Science
- Major Group 72/73 – Trades and Skilled Transportation Equipment Operators
- Major Group92 – Processing, Manufacturing and Utilities Supervisors and Skilled Operators
- Major Group 94-95 – Processing and Manufacturing Machine Operators and Assemblers

The Standard Occupational Classification 1980 (SOC80))

The Standard Occupational Classification, and the related occupational dictionary, The Canadian Classification and Dictionary of Occupations (CCDO), were the occupational standard for Canada before the NOC/SOC91 was introduced. The SOC consists of three levels of aggregation: major group, minor group and unit group.

The SOC /CCDO system was organized on the basis of type of work performed. The classification was intended to organize or catalogue the world of work. Occupational mobility was not a concern. In the four digit unit groups, the most detailed statistical level, there are often significant mixtures of skill level. For example, the college level is often mixed with the professional level. In the case of blue-collar work, helpers are classified with tradespersons.

SOC 80 is the most recent version of this classification and many important data sets are still coded to it. The 1991 Census is coded to both NOC (SOC91) and SOC 80. The 1995 Census is coded to NOC (SOC91). The Labour Force Survey (LFS) is just now changing, but will provide time series. For now, analysis of the LFS or LFS supplementary surveys such as the Adult Training Survey (ATS) must be based on the SOC 80. Much of the National Graduate Survey time series is coded only to the SOC80.

For these reasons, it was essential to code the Critical Skills to the SOC (80) as well as the NOC/SOC91 system.

Standard Industrial Classification (1980)

The Standard Industrial Classification 1980 (SIC80) provides a system for arranging 'producing units' into industries. The SIC is developed primarily for the purposes of identifying establishments with particular classes. If statistics from different surveys or other sources are to be integrated, it is essential that comparable industry classes be employed.

Where numbers permit, the SIC codes can be used to narrow down occupational codes. For example, the SIC codes identified below for biotech could be used to arrive at a number of Chemists (occupational code) in the Biotech industry.

The following section (in Italics) reproduces work previously undertaken on behalf of the Expert Panel. It outlines the SIC codes adopted to classify industry for the Study of Critical Skills. This section is included here as Industry coding is an essential element of the monitoring system.

SIC definitions for Key Sectors[2]

For the purposes of this study, the SIC codes identified are as follows:
These Canadian (1980) SIC Codes for the five sectors are drawn from:

Robert Chirinko and Andrew P. Meyer, "The User Cost if Capital and Investment Spending: Implications for Canadian Firms," in *Financing Growth in Canada*, the Industry Canada Research Series, University of Calgary Press, 1997.

1) Aerospace

3210 Aircraft and Aircraft Parts Industry
4523 Aircraft Servicing Industry

2) Automotive

3230 Motor Vehicle Industry (assembly)
3240 Truck and Bus Body and Trailer Industries
3250 Motor Vehicle Parts and Accessories
1510 Tire and Tube Industry

Advanced Materials and Plastics
1520 Plastics, Rubber Hose and Belting Industry
1590 Other Rubber Products
1600 Plastic Products Industries
3731 Plastic and Synthetic Resin Industry

3) Information and telecommunication technologies

This is a broader definition than I think we are considering, and depending on where independent ISPs fit in, they might have to be added. Telco and cable internet providers would already be here -- maybe ISPs are in the Other Telecom Industries 482.

3340 Record Player, Radio, and Television Receiver Industry
3350 Communication and Other Electronic Equipment Industries
3360 Office, Store, and Business Machine Industries
3370 Electrical Industrial Equipment Industry
3380 Communications and Energy Wire and Cable Industry
3911 Indicating, Record and Controlling Instruments
3912 Other Instruments and Related Products Industries
4814 Cable Television Industry
4820 Telecommunication Carriers Industry
4830 Other Telecommunication Industries

[2] Document from the Expert Panel Secretariat

5744 Computer Machinery, Equipment and Software, Wholesale
7720 Computer and Related Service

Software is included in the broad definition of the I&T industry, but is not a discrete industry in itself.
Rather, it is spread though several industry categories, including the above as well as others.

4) Biotechnology

3720 Agricultural Chemicals Industries
3740 Pharmaceutical and Medicine Industry

The "Paget" sector study published in 1996 defined the industry as "the 120 or so firms that are considered core biotechnology companies; that is, their principle business is 'new' or second-generation' biotechnology involving the industrial use of recombinant DNA, cell fusion and novel bioprocessing techniques."[3] The coverage includes biotechnology in agriculture, forestry, fisheries and pharmaceutical applications.

The study does not cite the specific SIC codes to which these firms would be classified, but they could be assigned to a variety of classifications including chemicals, services incidental to agriculture, to forestry, and fishing, government, universities and others. Rather than define the sector by industry, it may be better to identify it by occupations in a number of sectors, including the manufacturing industries they serve as well as universities. That emphasis would result in a focus on scientists and technologists for this sector.

5) Environmental Industries

The 1993 Sector Study Human Resources in the Environmental Industry indicates that this industry is spread over a number of industry classifications below the 4 digit SIC industry classes. In other words, Statistics Canada data is not published at a fine enough level to isolate the "Environment" Industry or any significant portion of it.

"Environmental" Manufacturing includes:
1) Water Pollution Control
2) Air Pollution Control
3) Solid Waste Management
4) Measuring and Monitoring Instruments and Control
5) Scientific Research and Laboratory Equipment
6) Chemicals for Pollution Control
7) Noise Control

"Environmental" Services Includes
1. Waste Handling and Environmental Facility Operation
2. Consultant Services

[3] Building Long-Term Capability Now: Canadian Human Resources Study in Biotechnology, Paget Consulting Group Inc., May 1996, p.iv.

3. Environmental Pollution and Assessment and Control
4. Laboratory Services and Related Field Services
5. Environmental Research
6. Natural Resource Conservation and Protection

These aspects of the industry do not correspond directly to defined industries in the Standard Industrial Classification. Instead environmental technologies firms are lurking in the weeds of several industries including mining, chemicals, machinery, and universities.
The only single industry defined by SIC codes looking something close to environmental is:

591 Waste Materials, Wholesale that includes:
5911 Auto wrecking
5919 Other Waste Materials

The SIC is a key element in Statistics Canada surveys including the Census of Population, the Labour Force Survey and the National Gradates Survey.

North American Industrial Classification System (NAICS)

Statistics Canada in conjunction with their counterparts in the United States and Mexico has developed NAICS. This is the first major redesign of the SIC since 1980.

Statistics Canada has developed a computer assisted coding product: 'Industry Classification Coding System (ICCS)' to assist researchers and coders in finding appropriate detailed industry codes for the 1980 SIC and NAICS Canada. This type of tool is especially useful in ensuring consistency of coding and easing the transition from one classification system to another.

NAICS Canada has been implemented in the Labour Force Survey and will be applied in the 2001 Census of Population.

Field of Study & Level of Education

The Field of Study and Levels of Education are maintained by the Centre of Education Statistics of Statistics Canada. The codes assigned in this document relate to the University Level, (USIS codes), the College Level (CCSIS Codes) and the Trade Vocational Level (TVOC Codes). University programs are organized according to Bachelor, Masters, and Doctorate. Universities, colleges and providers of vocational programs code their courses to this system. It is the major means of providing educational supply side data.

The Field of Study codes are widely used by Statistics Canada and are included in the Census of Population, the Labour Force Survey (LFS), the National Graduate Survey (NGS) and the Survey of Labour and Income Dynamics (SLID).

As well as providing the primary link to the educational supply side data, the Field of Study and Level of Level of Education can be used to further refine data based on occupation or industry. For example, in the case of Chemists, it is theoretically possible to obtain the number of doctoral graduates working as Chemists in Biotech by using occupation and industry data, further broken down by Level of Education. The success of type of approach depends on sample size and quality of measurement. It is therefore more useful in large industries and occupations with large numbers or workers.

The Fields of Study are not a classification system in the same sense as the NOC, SOC or SIC. In these latter cases, examples and definitions of each class are provided. The Fields of Study are rather a list of program titles, without definitions or statements of scope. This absence of clarity of definition can be expected to have an adverse effect on the quality of coding and the resulting data.

The current Fields of Study system is being phased out by Statistics Canada and will be replaced by the Classification of Instruction Programs (CIP), the classification currently used in the United States. CIP is a well-developed classification system with over 50 major categories and two additional levels of aggregation for each category. Definitions and examples are provided at each level. Examples of the types of levels:

03 Conservation and Renewable Natural Resources
0305 Forest and Related Sciences
030506 Forest Management

The CIP will be implemented incrementally within Statistics Canada surveys. However, it will not be adopted for the 1001 Census of Population. This means that Census data for almost ten years will be based on the present system.

National Surveys

The Census of Population, the Labour Force Survey (LFS), and the National Graduate Survey (NGS) are most able to contribute to a discussion about skills. All three collect information on the national basis on occupation, industry, field of study, and level of education.

The Census of Population

The Census of Population is focussed on the entire Canadian population. The short form is distributed to all Canadians and a long form is distributed to a sample of 25%. The long form addresses a wide number of issues including occupation, industry, field of study and level of education. Because of the large sample size, the Census of Population is able to report the most disaggregated data. For example, occupation is reported at the four-digit level.

The Labour Force Survey (LFS)

The Labour Force survey is a household survey administered by telephone on a monthly basis to representative sample of Canadian households. Like the Census of Population, it collects information on occupation, industry, field of study and level of education. Because of the smaller sample size, the LFS publishes occupational data at the 3-digit level. The LFS has the merit of timeliness, producing statistics on a monthly basis. It provides the foundation data for the Canadian Occupational Projection System (COPS).

The National Graduate Survey (NGS)

The NGS refers to a series of follow up surveys of post secondary graduates: university (bachelors, masters, and doctorate), college and vocational schools. Graduates of 1982 were followed-up in 1984 and 1987; 1986 graduates in 1988 and 1991; 1990 graduates in 1992 and 1995, and 1995 graduates in 1997. The output includes detailed occupational, field of study, industry, and level of education data.

The NGS provides a wealth of information about graduates and is the major suppler of education supply side data for the Canadian Occupational Projection Systems (COPS). Statistics Canada plans to replace the NGS with a new survey (The Post Secondary Transition Survey) that will include non-completers as well as graduates.

Other Relevant Development at Statistics Canada

Enhanced Student Information System (ESIS)

Related to the graduate survey and supply side data is the Enhanced Student Information System (ESIS). ESIS is being designed by Statistics Canada to replace current post secondary

enrollment and graduate surveys with a single survey. ESIS will capture total enrollment information at all Canadian post secondary institutions for a full twelve- month period. In order to do this Statistics Canada must request detailed information about both the institution(s) and the student(s) and the programs/courses in which they were enrolled.

ESIS is also being designed as a means of following students throughout their academic careers, in order to build a comprehensive picture of student flows within Canadian institutions. ESIS data will be linked to historical enrollment data from previous surveys (USIS, CCSIS and TVOC). In addition, ESIS will enable Statistics Canada to develop a sample frame for various student sample surveys. A detailed description of the ESIS project and its data elements are now available from Statistics Canada.

International Life Skills Survey

As an extension of its work on the International Literacy Survey, Statistics Canada is working with the OECD to develop measures, instruments and a pilot for a new international survey of individuals. The survey will encompass more then literacy elements. The new skills include problems solving, behaviors such as team work, work with information technology and perhaps, practical cognition (common sense). A pilot is scheduled for 2000 with 10 OECD counties. The main survey is slated for 2002.

Mapping of Critical Skills to Existing Classification Systems

Introduction

The critical skills listed were identified from a review of the Sector profiles developed for the Expert Panel on Critical Skills. These industry profiles provide summaries of the human resource issues and concerns of each industry. These concerns include reports of specific skill and occupation requirements.

There are limitations inherent in the methodology employed to collect the skill-based information:

- The skills were developed on the basis of secondary sources, not from the people actually responsible for the work such as hands on managers.
- A standardized methodology and 'language of skills' has not been developed for data collection so it is not possible to compare items between sectors or even between respondents with any great certainty.
- Without a systematic data collection methodology, there is no way of knowing if this list is comprehensive.

Nevertheless, the sector profiles provide us with a series of knowledges, occupations with specific skill requirements, cross-occupational skill and knowledge requirements and generic skills. Couched in the common language used for discussing skill requirements, they serve as proxies for skill clusters.

The Approach to Cross-referencing

The Critical Skills identified in this paper are represented by a combination of disciplines, industries, functions etc. They appear to be described as an inconsistent and incoherent mixture of dimensions.

That apparent inconsistency can perhaps be explained. Skill sets are made up of a mixture of academic knowledge, technical knowledge, industrial experience, physical skills, interpersonal skills, literacy, etc. When we talk about skill sets we are talking about a combination of these elements. The relative importance of these dimensions varies between skill sets. We tend therefore to identify skill sets in terms of the element which is most important, the one that "drives" the skill set.

The critical skills identified for this study are no exception. Examples of these "kinds of categories" or defining characteristics are outlined below. Hence, the can be mapped in a variety of kinds of categories:

1. Skill level - e.g. - Technical or professional
2. Kind of Work – e.g. Production
3. Discipline - e.g. Physics or biology
4. Industry - e. g. Automotive

5. Function - e.g Management, supervision
6. Generic – e.g. literacy, numeracy, problem solving
7. Employability - risk taking, work ethic, teamwork, adaptability, interpersonal

Most skill sets can be understood in terms of all of these categories. For this part of the study, we have identified skill sets by the category that seems to best define the most critical elements of the skill set.

For, example the requirement for skills of scientists at the graduate level has been labeled by discipline on the assumption that specific scientific knowledge, usually obtained at university, is the defining characteristic of this skill cluster. In this case, the discipline and its related occupation of field of study, becomes a proxy for the skill set.

On the other hand, in the case of management and supervision, the function is identified as the defining or lead category. In this case, the skill set is less specific, management referring to a more diverse set of skills, many of which are learned on the job as well as at university. This kind of skill set, while often constrained by particular industry or business knowledge is nevertheless most generally understood in terms of its function.

Identification by industry usually refers to specific knowledge and experience gained on the job. Sometimes this is the most important factor. This is especially the case in manufacturing production and assembly.

Monitoring is best understood in this context. For example, while the requirement for scientists is identified by a discipline which is then related to an occupational code and a field of study, one cannot assume that these categories alone adequately define the Critical Skill set. These codes or combinations of codes, are simply proxies for the skill set. They can in turn be related to the data and monitoring systems. However, the specific skill or knowledge detail within an occupational group is normally lost. For example, even though there is an NOC code for Science Managers, it is impossible to determine the particular skills of such managers. There is no means for measuring this level of detail.

List of Critical Skills by Industry

Table 1 - Critical Skills: Aerospace

Skills/Knowledge	NOC*	SOC 80 *	FOS *
Management			
Management • cost control • adoption of new technology • project management	0210	1131	41200
Sales and Marketing Management	0611	1137	41200
Market Research & Product development	4163	2311	41200
Technical Skills and Knowledge			
Aerospace Engineering, especially design	2146	2155	60500
Computer Science	2162	2183	80600
Instrument & Avionics Mechanics	2244	8539	52200
Skilled Trades and Production Work			
Aviation Maintenance & Overhaul	7315	8582	55220
Aircraft Assembly	9481	8515	55520
Combinations: • Engineers with computer skills • Management + Technical Skills, • Management + computer Skills • Technical with computer skills			
Generic/Essential Skills	Reference		
Communication	ES		
Teamwork	ES		
Problem solving,	ES		
Computer literacy	ES		
Work ethic	nil		
Mechanical aptitude	nil		

Note: CSTEC has developed industry wide transferable skills

Table 2 - Critical Skills: Automotive

Skills/Knowledge	NOC*	SOC 80*	FOS*
Management and Supervision			
Sales and Marketing Management	0611	1137	41200
Market Research & Product development	4163	2311	41200
Front Line Supervisors with management skills appropriate for the new and down-sized organization of manufacturing and industrial work.	9221	8510	82700
Technical Skills and Knowledge			
Process Engineering	2134	2142	60600
Industrial Engineering (including Manufacturing Technology)	2141	2145	61000
Mechanical Engineering	2132	2147	61200
• Industrial Engineering Technologist • CNC programming • Automotive design	2233	2165	55510
Skilled Trades			
Maintenance personnel (industrial millwrights and mechanics)	7311	8584	55270
Machining (including mould-making & pattern-making)	7231	8313	55550
Tool and die makers	7232	8311	55550
Industrial electricians	7242	8533	52110
Production			
Motor Vehicle Assembly	9482	8513	55520
Plastic Product Assembly	9495	857	55520
Generic Skills/ Essential Skills (production workers)	Reference		
Literacy and numeracy	ES		
computer literacy,	ES		
communications	ES		
mathematics	ES		
science (especially plastics – polymer)	Nil		

Table 3 - Critical Skills: Biotechnology

Skills/Knowledge	NOC*	SOC 80*	FOS*
Management			
Management: • Internal business development • Product development • Strategic alliance development and management • Intellectual Property • Domestic and international regulations • Technology transfer	0210	1131	41200 + Science degree
Financial Management	0111	1135	41200
Sales and Marketing Management	0611	1137	41200
Market Research & Product development	4163	2311	41200
Generic (management)skills: • communication • time management • interpersonal • problem-solving/analytical • marketing	Reference: Nil		
Technical Skills and Knowledge (master's, Ph.D. & post-doctoral level)			
biology	2121	2133	50900
chemistry	2112	2111	81500
biophysics	2111	2133	51200
genetics	2121	2133`	50910
microbiology	2121	2133	50912
biochemistry	2121	2133	50600
molecular biology	2121	2133	50900
physiology	2121	2123	70628 50900
pharmacology	2121	2133	70626
bioinformatics	2121	2133	50999
Combinations: • MBA + Science • Science + Science (e.g. chemist with postdoctoral degree in cell biology or computer science) • Science + Law + Business			
Technicians and technologists			
Laboratory science technicians	2211	2117	51200
Biological technicians	2221	2135	44500

Generic Skills (Research Scientist and Technician): communication interpersonal analytical skills ability to work in a team environment flexibility management skills	***Reference:*** *Nil*		

Table 4 - Critical Skills: Informatics & Telecommunication

Skills/Knowledge	**NOC***	**SOC 80***	**FOS***
Management Skills			
Sales and Marketing Management	0611	1137	41200
Market Research & Product development	4163	2311	41200
Technical Skills and Knowledge (especially master's level)			
Engineers with knowledge of software/networks, & communication (too general to code)	Nil		
Computer Engineering with 3-10 years experience	2147	2183	61400
Computer science with 3 – 10 years experience	2162	2183	80600
Telecommunication Engineering	2133	2144	60900
Note: Engineers with ability to innovate especially in demand			

A study has been conducted of LMI in the industry by EKOS Research

Table 5 - Critical Skills: Environment

Skills/Knowledge	NOC*	SOC 80*	FOS*
Management Skills			
Management (with 5 years of experience) in: • sales and marketing • project management • risk management • community relations • standards and practices • provincial, federal & foreign regulations • employee training	0211	1131	41200
Sales and Marketing Management	0611	1137	41200
Market Research & Product development	4163	2311	41200
Technical Skills and Knowledge (master's and Ph.D. level for scientists))			
Hydrology	2113	2112	81800
Geology	2113	2112	81800
Chemistry	2112	2111	81500
Physics	2111	2113	83000
Molecular biology	2121	2133	50900
Civil Engineering (hydrology)	2131	2143	60700
Chemical engineering	2134	2142	60600
Mechanical engineering	2132	2147	61200
Electrical Engineering	2133	2144	60900
Industrial engineering	2141	2145	61000
Technicians and Technologists			
Environmental protection: • statistics • chemistry • biology • geology • civil engineering	[2211, 2263 & 2231]	2165 & 2117	67100, 67200, 67400 & 67500
Natural Resource Conservation: • resource management • agronomy • forestry • biology • soil science • ecology	[2221, 2223, 2212 & 2224]	2135	67300, 67600, 50326, 50900, 81500 & 81800

• horticulture			
Generic Skills	***Reference***		
Communication	ES		

Roll up of NOC, SOC and FOS codes for Critical Skill Elements
(that could be mapped to occupation or field of study)

Table 6

Skill/ knowledge	NOC *	SOC 80*	FOS*	Industry*
Management				
Science management: Specific Areas of experience and expertise required: • Cost control • Adoption of new technology • Project management • Internal business development • Product development • Strategic alliance development and management • Intellectual Property • Domestic and international regulations • Technology transfer • Risk management • Community relations • Standards and practices • Provincial, federal & foreign regulations • Employee training • Marketing	0210	1131	41200	A, B,I, E
Manufacturing management	0911	1143	41200	Au
Sales and Marketing Management	0611	1137	41200	All
Market Research & Product development	4163	2311	41200	All
Financial Management	0111	1135	41200	B
Front Line Supervision: skills related to management of change	9221	8510	82700	Au
Scientific				
Physics	2111	2113	83000	E
Biophysics	2111	2133	51200	B
Bioinformatics	2121	2133	50999	B
Chemistry	2112	2111	81500	B, E
Biochemistry	2112	2133	50600	B
Hydrology	2113	2112	81800	E
Geology	2113	2112	81800	E
Genetics	2121	2133	50910	B
Microbiology	2121	2133	50912	B
Molecular biology	2121	2133	50900	B, E
Physiology	2121	2133	70628	B

Pharmacology	2121	2133	70626	B
Computer Science	2162	2183	80600	A, I
Engineering				
Industrial Engineering	2141	2145	61000	Au, E
Hydrology (Civil engineering)	2131	2143	60700	E
Mechanical engineering	2132	2147	61200	Au, E
Electrical engineering (including telecommunications)	2133	2144	60900	E, I
Chemical engineering	2134	2142	60600	E
Process Engineering (Plastics)	2134	2142	60600	Au
Aerospace engineering	2146	2155	60500	A
Computer engineering	2147	2183	61400	I
Technical				
Laboratory science technicians	2211	2117	51200	B
Biological technicians	2221	2135	44500	B
Environmental protection technologies: • statistics • chemistry • biology • geology • civil engineering	2211, 2231 & 2263	2165 & 2117	67100, 67200, 67400 & 67500	E
Natural resource conservation technologies: • resource management • agronomy • forestry • biology • soil science • ecology • horticulture	2221, 2223, 2212 & 2224	2135	67300, 67600, 50326, 50900, 81500 & 81800	E
Instrument & Avionics Mechanics	2244	8539	52220	A
Industrial Engineering Technologists	2233	2165	55510	Au
Skilled Trades				
Machining (including mold-making and pattern-making)	7231	8313	55550	Au
Tool and Die Making	7232	8311	55550	Au
Maintenance personnel (industrial millwrights and mechanics)	7311	8584	55270	Au
Industrial electricians	7242	8533	52110	Au
Aviation Maintenance and Overhaul	7315	8582	55220	A
Production				
Aircraft Assembly	9481	8515	55520	A
Motor Vehicle Assembly	9482	8513	55520	Au
Plastic Product Assembly	9495	857	55520	Au

Roll up of Critical Skills that cannot be mapped to NOC, SOC or Field of Study

Table 7 - Critical Skill/Discipline Combinations

Occupational Category	Additional Required Skills and Knowledge	Additional Required Skills and Knowledge	Additional Required Skills and Knowledge	Industry Source
Management (experience)	Computer Skills	Technical Skills		A
Scientific (Masters' or Ph.D. level)	Computer Skills	Business & Management Skills	Second Science Qualification or Law	A,B
Engineering	Computer Skills	Business Skills		A,I
Technical	Computer Skills			A

Table 8 - Generic Skills Requirements Identified for Management, Professional/Technical, and Trades & Production Workers

Generic skills	Reference	Management	Scientific/ Technical	Trades & Production Workers	Source Industry Profile
Communication	ES	X	X	X	A, Au, B, E
Literacy	ES			X	Au
Numeracy & mathematics	ES			X	Au
Problem solving /Analytic	ES	X	X	X	A,B
Teamwork	ES		X	X	A,B
Time Management	ES	X			B
Interpersonal		X	X		B
Flexibility			X		B
Innovation		X			I
Computer Literacy	ES			X	A, Au
Mechanical Aptitude			X		A
Science				X	Au
Work Ethic				X	A

* ***Legend***:

- *NOC – National Occupational Classification*
- *SOC 80 – Standard Occupational Classification 1980*
- *FOS – Field of Study*
- *ES – Essential Skills*
- *A – Aerospace*
- *Au – Automotive*

- *B – Biotechnology*
- *I – Informatics & Telecommunication*
- *E - Environment*

Ability of Monitoring Infrastructure to Capture Key Skill Areas.

Monitoring systems such as classifications do not directly capture skills. Monitoring systems are designed to collect data and measure change, but change at a macro level. Skills data is very detailed and requires specialized data collection and analysis methods.

The way only way in which these systems can provide information about trends in key skill areas is through a series of proxies which capture a part of a skill area. For example:

- Depending on the classification criteria, occupation can be a proxy for an area of knowledge e.g. chemistry; a type of work, e.g. management , a work activity, e.g. tool and die making and a skill level.
- Industry is usually a proxy for specific industry related knowledge and experience
- Field of Study and Level of Education provide a framework for information about the supply of graduates at a particular level with a specific knowledge set. They can also be used to further specify occupational and/or industry data.

Combined, these monitoring systems should be able to isolate some types of significant skill sets. However, this ability is severely restricted by operational difficulties:

Timeliness of data. For example, the Census of Population is available between two and three years after the Census. The Census is conducted every 5 years.

Level of detail of data. The LFS is timely, but sample size places limits on the level of detail and the number of factors that can be used.

The number of persons and jobs in specialized high growth areas. The limiting factor is not just the sample size of surveys such as the LFS, but also the limited number in some highly skilled areas in Canada

- For example, data drawn from the 1998 Adult Education and Training Survey (occupation by the 5 industry sectors) found 20 chemists, 11 Biologists and 1 Physicist. These kind of numbers cannot support analysis.
- This is not the case in all occupations identified. For example, the 1996 Census (occupation by industry) found 2425 persons to be Aircraft machinists. It is probably possible to look further at level of education.

No matter how successful the use of proxies, the available proxies cannot provide skill particulars such as information about management techniques or chemistry specializations, or particular technologies.

Regarding the currency and quality of the existing monitoring systems, Canada is in a favoured position. The occupational classification (NOC and SOC91)) were designed in the last decade.

A new industry classification system (NAICS Canada) is being implemented and a more elaborate field of study classification will be introduced gradually within Statistics Canada. Internationally, the work of Statistics Canada and HRDC in these areas is very much respected.

Information Systems positioned within the NOC Framework

In this phase of the project we looked at information systems which are linked to the NOC . These systems are linked to the data and monitoring systems outlined above and also to each other. In this sense, Canada has a very well developed system of occupational infrastructure. The NOC provides a common framework, within which it is possible to explore a diverse set of occupational-related elements. These include the following:

- Work related skill profiles
- Enabling (generic) skills
- Worker Ratings (e.g. Aptitudes, interests, data, people, things, etc.)
- Occupational outlook (Job Futures)
- Local Labour Market Information (LMI)

Skill Profiles (JOBSCAN)

The JOBSCAN skill profiles were developed by HRDC to provide a comprehensive set of cross-occupational and occupation-specific skills. While the NOC organizes occupations into various categories and provides a macro framework for the world of work, the skill profiles function at a micro level by identifying specific occupational skills and specialization.

These skill profiles are based on on-going occupational research. The skills and specializations are eclectic in nature and can include education, licensing, academic fields of specialization e.g. (biophysics), particular industry specializations, type of work (e.g. project management), etc. See ***Appendix 1*** for examples drawn from the Electronic Labour Exchange: 'Biologist' and 'Tool and Die Maker'.

The kinds of information included vary according to the nature of the work. For example, professional occupations usually contain very specific industry and academic categories. Trades may emphasize technologies or competencies (e.g. machining to a particular tolerance). The emphasis changes depending on the nature of the work and the type of skill requirements identified by employers.

HRDC's skill profiles form the basis for the Electronic Labour Exchange (ELE), which allows job matching on the basis of skills within NOC unit groups. The majority of the Critical Skills identified by industry in this study (except for the generic skills) can be found on these checklists. ELE is not programmed to search for skills across occupations.

Theoretically, ELE could be a source of skill-based labour market information. Unfortunately, it does not have the labour market penetration to make it a source of reliable skills data.

The Skill Profiles could provide a common language for occupational skills and a data collection tool for skill-based information that in turn can be linked to the monitoring systems. If they are to be used as a part of a systematic strategy to collect skill-based data, a priority will have be placed on their further and continued development and maintenance.

Essential Skills

Essential Skills is another skill-based system developed by HRDC. Like the Skill Profiles, the Essential Skills project is extremely relevant to the Expert Panel's work on Critical Skills.

Essential skills are 'enabling' skills that:
- Help people perform the tasks required by their occupation
- Provide workers with a foundation to learn skills that are occupation-specific
- Enhance people's ability to adapt to workplace change

HRDC has undertaken a project to developed Essential Skill Profiles for 150 (NOC) occupational groups. Each Essential Skill factor has an associated rating scale. Jobs are studied and the skill requirements of the occupation determined based on the work performed. See ***Appendix 2*** for an outline and excerpts from the Essential Skills Profile for ***Aircraft Assemblers and Assembly Inspectors.***

'Essential Skills' includes the following:
- Reading Text
- Use of Documents
- Writing
- Numeracy
- Oral Communication
- Thinking Skills (Problem Solving, Decision Making, Job task planning and Organizing, Significant use of memory, Find information)
- Working with Others
- Computer Use
- Continuous Learning

Essential Skills Profiles are presented at a very disaggregated level, suitable for curriculum development. A more aggregate level would enhance its usefulness for monitoring.

HRDC is expected to continue work in this area and expand the coverage of Essential Skill Profiles. The Essential Skills factors related to literacy are compatible with those used in the National Literacy Survey.

The Career Handbook

The Career Handbook is a companion piece to the NOC. It is a reference guide to career exploration, career planning, and career development.

The Career Handbook links work performed in occupations with worker characteristics. It provides rating for each 4-digit NOC* occupational group on the following factors.

- Aptitudes
- Interests
- Data/People/Things
- Physical Activities
- Environmental Conditions
- Education/Training Indicators

*In many cases the Handbook provides another level of detail (5- digit occupations or groups) in order to develop unique worker- characteristics profiles.

The Data/People/Things framework is especially relevant for this study. It was developed by Dr. Sidney Fine and has influenced the discussion and vocabulary of skills in North America for more than thirty years.

Job Futures

Job Futures is the primary source of national labour market information. It combines economic outlook information with national statistics and occupational information.

Job Futures is made up of two volumes: Volume I - Occupational Outlooks and Volume 2 - Career Outlooks for Graduates.

Occupational Outlooks

Volume I of Job Futures provides information on 211 NOC occupational groups covering all jobs in Canada. The information includes:

- types of employers who hire workers in the group
- job duties and responsibilities
- the level and type of education, training and experience required of workers in the group
- main labour market characteristics of the group
- current prospects of finding work in occupations in the group, and

- job prospects for the next five years.

The Occupational Outlook document integrates information from the National Occupational Classification (NOC), the Census of Population, the Labour Force Survey, Employment Insurance Statistics, and COPS projections. The projections take in account future employer requirements, the number of people will be seeking work in the occupational group, and the speed at which current labour market conditions are expected to change.

Career Outlooks for Graduates (Volume Two)

Career Outlooks for Graduates traces the school to work transition for graduates of Vocational, College, and University (bachelor, masters, doctorate) programs based on Field of Study. Information on each program of study includes:

- content of program
- availability in Canada
- prerequisites
- major occupations in which recent graduates found work
- how theses graduates feel about their educational choices and their jobs
- early labour market experience of these graduates (employment, full time work, part time etc.)
- current labour market prospects for these graduates
- job prospects for graduates over the next five years

The information in Volume Two is based on the National Graduates' Survey as well as the COPS model and other Statistics Canada data.

Local LMI systems (National and Provincial)

Local labour market information (provincial, regional or city) is available at both provincial and HRDC regional web sites. The information is similar to that provided by Job Futures but also includes regional profiles outlining the number of jobs by occupation, local demand, distribution by sex, local wage data, local associations, sometimes local sources of training. In some provinces, generic and soft skill profiles have been added for each NOC occupation.

Data collection is based on provincial and/or HRDC regional administrative or survey data. As with Job Futures, the information is presented within the context provided by the standard monitoring systems e.g. NOC, SIC etc.

Other Sources of Skills Information Compatible with Monitoring Systems

Occupational Standards

Occupational standards provide the detailed statements of tasks and competencies required by worker to be able to perform the work. Occupational Standards have been developed in Canada at a national and provincial level as a means of defining scope of work, curriculum development, testing of competency.

Red Seal Program

On the national level the oldest program is the Red Seal Program, a co-operative effort of the Canadian Council of Directors of Apprenticeship (CCDA) and HRDC to develop a common definition at a task and sub-task level of apprenticeable trades across Canada. This common definition of scope and content allows for the development of national apprentice examinations, which in turn facilitate the movement of workers across Canada. The Ellis Chart (1997) - A Comparative Chart of Apprenticeship Training Programs contains a comprehensive overview of provincial training programs for 164 trades.

Plans are underway to develop Essential Skill Profiles for all the Red Seal trades.

Sectoral Standards

A number of industrial sectors and professional and technical professional associations have developed private sector driven occupational standards.

Most of these standards have been framed in terms of competencies. Two are particularly relevant to the work of the Expert Panel: the ten environmental occupations developed by the Canadian Council for Human Resources in the Environment Industry for technicians and technologists and the National Standards for Applied Science and Engineering Technologies developed by the Canadian Technology Human Resources Board.

Canadian Career Consortium Products

The Canadian Career Consortium is a coalition of four partners: HRDC, the Canadian Labour Force Development Board, the Canada Career Information Partnership (a group representing provincial educators and career information developers), and the Industry Sector Councils. It's mandate is to develop and deliver quality career information to Canadians. Much of the career information formerly produced by HRDC will be developed and maintained under this umbrella.

While a large substantial number of career information products are available, the messages to students regarding skills are not specific, except in the case of generic and 'soft' skills.

The Ability of NOC related Information Systems to provide information about Skills

- HRDC's Skill Profiles and Essential Skills are both skill-based systems. They are the only systems developed for the purpose of measuring skills in the workplace that have been reviewed in this study. They have much to contribute on any ongoing discussion and development of skill-based information systems.
- The Career Handbook, with its extensive systems of ratings including Data, People Things might be useful in developing a language of skills.
- Jobs Futures and the provincial LMI systems are grounded in occupation, industry and field of study. They provide excellent labour market information. However, they contribute little to our understanding of skill requirements.
- Occupational standards provide detailed information regarding tasks and competencies. This is important for curriculum development and evaluation, but not particularly appropriate for monitoring activities

Private-Sector Sources of Skills Data

The following section provides just a sketch of the type of information available from four types of private sources. It is by no means comprehensive. That would require a study on its own. However, it does provide a glimpse of methodologies employed and the kind of information that is likely to be available.

Internet recruitment

Recent media reports indicate that the use of Internet job-matching services is on the rise in North America. "The Internet is on its way to displacing recruiting agencies as the corporate world's weapon of choice for finding skilled employees, a new survey has found", Globe and mail, Feb 18, 1999. "There are about 9.5 million Canadians with Internet access and more than 300,000 of them have posted resumes on-line."

The value of Internet job matching services as a potential source of labour market information increases as more employers use the services as an efficient means of meeting their human resources needs, and as more Internet users post their candidacy on-line. Job matching services typically ask employers to classify their listings by job-type (classification codes vary by site). If employers list wage information then this could become part of their overall database.

While the databases are available for employers who subscribe to the service, contacts with the owners/managers of the on-line services indicate that most databases can also be made available for the purpose of labour market research.

Using InforSeek and Yahoo search engines, we reviewed the primary sites offering jobs in Canada. ***See Appendix 3*** for details of each site we reviewed. Text referring to the provision of labour market or salary information is bolded and highlighted.

While these sites present very interesting possibilities for the future, the categories of jobs/skills/industries used on the Web are less suitable for the collection of skills data than the HRDC and Statistics Canada vehicles. There is no standard or rationalized language. Most do not provide definitions of their terms. While these systems may be very useful for organizing job vacancies and worker resumes, they are not appropriate for collecting skill-based information

Professional and Industry Associations

The following professional associations/organizations were contacted by e-mail, and websites were reviewed to determine whether membership statistics are maintained regarding professional discipline, job function, level of responsibility, industry, and company size.

Aerospace Industry Association **www.aia-aerospace.org**
Biotechnology - Canadian Sources of Information **www.nrc.ca/ibc/canada/can-info**
Biotechnology Human Resource Council **www.bhrc.ca**
Canadian Advanced Technology Alliance **www.cata.ca**
Canadian Council of Technicians and Technologists **www.cctt.ca**

Canadian Plastics Industry Association **www.plastics.ca**
Canadian Institute of Forestry **www.cif-ifc.org**
Canadian Society for Chemical Technology **www.chem-inst-can.org**
Canadian Council of Professional Engineers **www.ccpe.ca**
International Association of Machinists **www.iam160.com**

Most association/organizations do not maintain central databases of labour related or training data. This information tends to be addressed at the constituent level. Such an analysis would involve contacting all constituents of all associations individually. Most associations list their constituent organizations and e-mail addresses on their websites. Many constituent organizations were contacted, but few responses were received. It seems likely that non-response can be interpreted to mean that the organization does not collect and maintain the information requested.

- The **Aerospace Industry Association** provides a "Facts and Figures" section on their website with statistics regarding employment and wage rates by sector (transportation/public utilities, manufacturing and service) for its members.

- The **Biotechnology Human Resource Council** is mandated to develop a strategy to meet the future skill requirements of the Canadian biotechnology industry, and ensure its competitiveness. The council publishes a Job Bank on its site, and may be a good source of labour market information for the biotechnology industry.

- Among its services, the **Canadian Institute of Biotechnology** offers to its members: surveys and studies covering trends, economic and market information, public interest and training needs.

- The **Canadian Advanced Technology Alliance (CATA)** is a national trade association which provides business services for members and has a mission to "stimulate 'Global Business Growth' through the forces of Canadian innovation and strategic partnership". Among it services is TechnoSkill, a service which links experienced and technically skilled individuals with employers in the high-tech industry. CATA also provides a "Human Resources Professionals Network for Technology Executives" which provides services which include a skills shortage survey, a compensation survey, innovative skill mapping, and industry-specific management training programs and certification.

- **The Canadian Council of Professional Engineers CCPE** (through the Canadian Engineering Human Resources Board) undertook a National Survey in 1997 obtaining information on discipline, industry, occupation, job function, level of responsibility and salary levels for engineers that are licensed in Canada. The CCPE also publishes an annual report on enrolment, undergraduate and post-graduate degrees awarded at the various engineering programs across Canada. Most of the CCPE constituent associations are involved to some degree in promoting continuing education, through other organizations. Similarly, the larger associations do regular salary surveys.

- The **Canadian Council of Technicians and Technologists** does not maintain data on individual memberships. All membership related information including salary surveys and job opportunities is done through its constituent associations.

- The **Canadian Plastics Industry Association** offers several councils (eg. Automotive Council, Construction Council, Expanded Polystyrene Council, etc.) in which member companies participate and share information.

- The **Canadian Institute of Forestry** makes no reference to the availability of human resources data on its website. A response from one of its constituent associations, the **Alberta Registered Professional Foresters Association**, indicated that it kept only registration information (contact addresses, employers etc.) of its members. They do not maintain any information related to professional specialization and job responsibilities. It has a Continuing Forestry Education (CFE) Program with mandatory reporting requirements. They also keep a database of credit hours (days) each individual reports during the course of a reporting period (July 1 to June 30, annually). Registered Professional Foresters report the number of activities they attend (conferences, workshops, courses, etc.). The association does not maintain any wage data. It has considered conducting a salary survey but not has not acted on it yet. This is probably an indication of the type of data available from the remaining CIF constituent associations.

- **The Canadian Society for Chemical Technology (CSChE)** has developed the Chemical Engineering Recruiting and Expertise System (CERES) as a means of finding employment for its members. There are positions listed for chemists, chemical technologists as well as the chemical engineers. This organization also publishes employment opportunities in Canadian Chemical News, the newsmagazine of The CIC.

Newspapers

Compilations of newspaper advertisements are available from at least three sources.

CareerClick

CareerClick is a database of current job opportunities, incorporating the word ads and display classifieds from the Vancouver Sun and Province, the Calgary Herald, the Edmonton Journal, the Windsor Star, the Ottawa Citizen and the Montreal Gazette. They have more than 18,000 resumes in their database.

CareerClick can provide the following services:

- Labour market information based on the resumes and jobs databases on a regular basis.
- Some wage data, based on information contained in the original advertising.
- This information can be sent electronically with costs for custom database queries or a flat rate for self-directed keyword searches.

See ***Appendix 4*** for the list of CareerClick categories

Globecareers.com www.globecareers.com is another one of Canada's major databases of current job opportunities, providing an on-line job listing service to the public. It is a product of the Globe and Mail. Jobs are posted by the following job categories:

Administrative
Arts/humanities
Computer
Education
Engineering/science
Financial
Health/medical
Management
Marketing/sales
Other
Professional
Trades/service

See ***Appendix 4*** for more details.

Canada Employment Weekly **http://www.mediacorp2.com/**

Canada Employment Weekly lists job opportunities from across Canada on a weekly basis. This paper has been published continuously since 1993.

Researchers review career advertisements and job postings from across the country. They track full-time positions with companies and organizations.

For each job listing a report is provided which includes a description of the position, the qualifications required, any deadline date or competition number. The report also includes background information on the employer (or search firm) publicizing the position. Job reports are indexed by occupation. There are over 60 occupational categories in the Canada Employment Weekly. See ***Appendix 4*** for the list of categories.

Recruitment Agencies

Recruitment Agencies would thought to be a possible source of skill based information. A complete list of Canadian recruiting services can be found with the following sites: The Directory of Canadian Recruiters and the Canadian Directory of Search Firms. ***See Appendix 5*** for details.

It was not possible to investigate the search firms in greater deal due to time constraints. However, it seems fair to assume that the labour market information they would be able to provide would be similar to that provided by the internet recruitment (see Appendix 3) The Geographic Index lists the search firms by city and town for every province and territory of Canada.

An Internet search of Canadian Employment Agencies and job matching services revealed that there are several thousand recruitment professionals in Canada.

Assessment of Private Sector Skills Information

Labour market information is a by-product for most of the types of enterprises reviewed. Information about skills is not usually collected or disseminated.

However, some skills information can be obtained through searches of systems such as CareerClick derived from newspaper advertisements.

Few professional or industry associations have undertaken the task of producing skills-based information about their membership. An exception is the work done by the Canadian Council of Professional Engineers, who through their 1997 survey have documented the knowledge, skills and industry experience of their membership using a systematic skills questionnaire. This questionnaire produces information similar to that of the Skill Profiles developed by HRDC.

It would seem there is a potential for growth in this area, especially with the professional and industry associations, but it is unlikely to be fruitful without the development of a standard language for skills and a methodology for collection and dissemination of this information.

Conclusions:

- Monitoring systems such as occupational and industry classifications do not directly capture skills. Monitoring systems[4] are designed to collect data and measure change, but change at a macro level.

- Skills data is very detailed and requires specialized data collection and analysis methods. Canada's monitoring systems do not deliver skills information.

- Some indirect skills information can be derived by using proxies such as occupation, industry and field or level of education in the analysis of data.

- There is no common framework or language of skills to define, measure or relate them to one another or to support the collection of data. HRDC's work in the development of the Skill Profiles (the foundation of ELE) and Essential Skills provide a starting point.

- The Skill Profiles and Essential Skills are both skill-based systems. They were developed for the purpose of identifying skills in the workplace. They have much to contribute to any ongoing discussion and development of skill-based information systems.

- There is no standard methodology with which to collect skills information. Most studies attempting to collect skills information have open ended questions or provide respondents with an ad hoc list of skills. Comparability between studies is not possible.

- Very little qualitative or quantitative information about skills is available from any of the sources reviewed. This absence of skills information seems to be uniform. It does not have sectoral implications

- The collection and analysis of skills information is time consuming and expensive. It does not lend itself to large household surveys. Surveys of establishments might be more appropriate but are notoriously difficult to implement. Since universal coverage of all skills in the economy is not likely required, special surveys using a standard language and methodology probably provide the best means to collect skills information

[4] Canadian monitoring systems are very rich by international standards: the classifications are up to date, numerous very rich surveys collect labour market information which in turn provide an abundance of occupational, educational and industry information, some of which is useful in the pursuit of skills4.

Appendix I: Example of Skill Profile from ELE

BIOLOGISTS SKILL PROFILE (FROM ELE)

Type of Work Experience
Biotechnical company
Chemical company
Educational institution
Environmental consulting company
Government
Health institution
Pharmaceutical company
Resource or utility company
Research institute
Applied non-industrial research
Industrial research and development
Resource exploitation and development
Resource exploration
Statistical analysis
Theoretical or fundamental research
Quality assurance or control
Regulatory investigation
Other work setting experience:

Specialization in Biology
Algology
Anatomy
Aquatic biology
Bacteriology
Biochemistry
Biophysics
Biosystematics or taxonomy
Biotechnology
Botany
Cell biology
Cryobiology
Diagnostics
Ecology
Embryology
Entomology
Epidemiology
Genetics
Histology
Immunochemistry
Immunobiology
Immunology
Infections and pathogenesis
Limnology
Microbiology
Molecular biology
Mycology
Palaeontology
Parasitology
Pharmacology
Physiology
Plant physiology
Plant pathology or phytopathology
Protozoology
Toxicology
Virology
Zoology
Other specializations in biology:

Sector Experience
Agriculture
Beverage processing
Fisheries
Food processing
Food or dairy products
Forestry
Pharmaceuticals and medicines
Sanitation and public health
Veterinary
Medical instruments and devices
Mineral resources or mining
Municipal water treatment
Health
Other sector experience:

Industrial Processes and Biological Studies
Industrial health and safety
Product development
Drug evaluation and testing
Clinical trials
Other industrial processes and biological studies:

Environmental Studies
Environmental assessment and monitoring
Industrial waste treatment
Municipal and industrial waste management
Nuclear waste management
Site remediation
Toxicology studies
Waste resources reutilization
Other environmental studies:

Regulatory Investigation
Government regulations control
Toxins evaluation and control
Development of regulatory programs
ISO 14000 compliance analysis
Other regulatory investigation:

Project and Personnel Management Skills
Manage research projects
Manage field studies
Financial or budget management
Multidisciplinary projects coordination
Preparing or evaluating technical proposals
Technical writing and article authoring
Staff recruitment and selection
Staff training and development
Supervise laboratory technical personnel

Supervise field crews
Supervise other biologists
Other project and personnel management skills

TOOL & DIE SKILL PROFILE (ELE)

Tool and Die Fabrication Experience

Gauges or instruments
Jigs and fixtures
Metal cutting, forming or bending dies
Compound or progressive transfer dies
Forging dies
Extrusion dies
Other tool and die fabrication experience:

Metal Mould-Making Experience

Blow moulds
Injection moulds
Compression moulds
Transfer moulds
Rotational moulds
Thermal forming moulds
Vacuum forming moulds
Other metal mould-making experience:

Patternmaking Experience

Master patterns
Metal patternmaking
Core boxes
Wood patternmaking
Production pattern equipment
Plastics patternmaking
Foundry match plate work
Other patternmaking experience:
Specialized Machining Processes
Ultrasonic
Plasma ARC
Laser beam
Water jet
Other specialized machining processes:

Specific Skills

Machine tools to close tolerances
Design tools, moulds, jigs and fixtures
Verify dimensions of machine parts
Fabricate gauges, dies and moulds
Machine, fit and assemble parts
Inspect and test final products
Set up machine tools
Program and set up numericallycontrolled machines
Set up and operate electrical discharge machines

Additional Skills
Instruct apprentices

Appendix II: Essential Skills Profile For Aircraft Assemblers and Aircraft Assembly Inspectors (NOC 9481)

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SINCE THE ESSENTIAL SKILLS PROFILE IS RATHER LENGTHY, JUST TWO SECTIONS HAVE BEEN CHOSEN FOR PRESENTATION ON THE FOLLOWING PAGE: 'WORKING WITH OTHERS' AND 'COMPUTER USE'.

Excerpt from Essential Skills Profile:

G. Working with Others

Aircraft assemblers and aircraft assembly inspectors work independently on most tasks. They may work with partners when installing heavy units or in doing jobs which require several kinds of expertise. Some functions, such as rebuilding assemblies, are carried out by work crews as team projects.

Participation in Supervisory or Leadership Activities

Aircraft assemblers and aircraft assembly inspectors:

>>> participate in formal discussions about work processes or product improvement.
>>> have opportunities to make suggestions on improving work processes.
>> monitor the work performance of others.
>>> inform other workers or demonstrate to them how tasks are performed.
>> orient new employees.
> make hiring recommendations.
> assign routine tasks to other workers.
> assign new or unusual tasks to other workers.
>> identify training that is required by, or would be useful for, other workers.
> deal with other workers' grievances or complaints.

H. Computer Use

The computer use tasks of aircraft assemblers and aircraft assembly inspectors are at Complexity Level 2.

Computer Use Profile

Aircraft assemblers and aircraft assembly inspectors may:

> use word processing. For example, they may write a non-conformance report.
>> use a database. For example, they seek parts information on a database.
> use communications software. For example, they may use e-mail.
> use custom-designed computer programs to read procedures and review descriptions of problems.

Note: Throughout this document, the following codes have been used:
>>> indicates that most respondents (60% or more) use that skill
>> indicates that some respondents (31% - 59%) use that skill
> indicates that few respondents (11% - 30%) use that skill.
Skills used by 10% of respondents or fewer are not reported.

Appendix III: Online Recruitment

An Internet search of Canadian Employment Agencies and job matching services revealed that there are several thousand recruitment professionals in Canada. The following is a listing of InfoSeek, and Yahoo search engines' most prominent recruitment sites and their labour market indicator potential.

1. NetJobs, Careers Online, www.netjobs.com

NetJobs Information Services is an Internet publishing service division of Sea Change, that provides a central location for employment seekers to facilitate their job search on the Internet. NetJobs creates an interactive forum for the exchange of information related to employment and acts as an arena for recruitment. Careers Online NetJobs provides organizations actively advertising openings in their companies, to post their job listings into its database for individuals to browse. **Individuals can search the database using different criteria; category, company/organization name, and job location.**

The site uses the following job categories:

Communications
Engineering/Technical
Information Systems - Programmer/Analyst
Information Systems - other
Information Systems
Insurance Industry
Internetworking Division
Networking/Network Design
Sales
Sales/Marketing
Technical Sales
Travel and Tourism

2. Canadajobs.com www.canadajobs.com

Canadajobs.com provides links to job resources in Canada. The site is divided into the four sections:

- Canadian Resources -- resources which have job listings all over Canada
- International Resources -- resources from other countries (usually the United States) which also have listings for Canada
- National Companies -- a list of companies with job listings on their pages that hire in many areas of Canada
- Newsgroups -- links to and information about USENET newsgroups with job listings in Canada

This site also has extensive listings of resources for Calgary, Ottawa, Toronto, and Vancouver which include local job databases, employment agencies, and links to a few hundred companies that are now hiring. **The site itself provides no labour-related statistical information, but provides links to those that do.**

3. Career Mosaic **http://canada.careermosaic.com**

CareerMosaic Canada provides a search service of its comprehensive, up-to-date database of job opportunities all over the world. Career Mosaic also provides a search service for the top USENET newsgroups.

The following is a list of Canadian newsgroups indexed by the site:

ab.jobs
bc.jobs
can.jobs
kw.jobs
nb.jobs
ont.jobs
ott.jobs
qc.jobs
tor.jobs

The website does not indicate the specific parameters by which the data is organized (job type, salary, location, etc).

4. **Actijob.com WWW.Actijob.com**

Actijob.com provides a job search service and maintains a database of job listings coded by the HRDC national occupational classification codes as follows:

- business finance and administration
- natural and applied science, computer science and engineering
- health occupations
- social science education and government service
- art, culture, recreation and sport
- sales and services
- trades, transport and equipment operators
- occupations unique to primary industry
- occupation unique to processing manufacturing and utilities

Job listings are also organized into the following 28 industry categories as defined by Actijob.com:

aerospace engineering, deployment and management
biotechnology, biomedical and biopharmaceutical
complex engineering, consulting, analysis and project management
construction, real estate and urban planning
energy, petroleum, biochemistry
environment, recycling, pollution control and water quality
financial service, banks, insurance and brokerage
health, medicate, dental care and pharmaceutical
human resources, recruiting and personnel management
information technology, software and internet
land, train, air and sea transport
legal services and law enforcement
marketing, publicity, communication and creativity
media, journalism and writing
micro-electronics, computer devices and instrumentation
natural resources, minerals and mining
nutrition and food management
optics, lasers, photonics and nanotechnologies
public administration and social services
retailing, reselling and distribution
robotics, automoation, manufacturing and factory production
teaching and training
telecommunications, fibre-optic, cellular and satellite
telemarketing, call centres and electronic commerce
textile, clothes, and fashion
tourism, hotels, and restaurants
vehicle engineering, mechanics and maintenance

Actijob.com also provides wage and salary data associated with their job listings.

5. Jobsat **WWW.Jobsat.com**

JobSAT maintains the largest employment database in Canada, providing thousands of job opportunities from across the world. These employment opportunities cover a full range of entry-level to senior management positions in the private, public, and voluntary sectors.

JobSAT is a well-established employment database provider which has been serving professionals for over 7 years. In addition, they claim to have over 31445 employment opportunities in their job database.

Products/Services
The JobSAT Intelligent HR Manager is a management tool for the HR Industry. The purpose of the Intelligent HR Manager is to help HR professionals match supply and demand information for the human resources industry. **The system also provides statistics related to the human**

resource industry (i.e. statistical information related to various industry trends, geographical trends, educational trends, etc.).

6. The Employment Network **www.can-employ.com**

The Canadian Employment Network offers this FREE service to registered Employers. The resumes are categorized by region and job category, and they can also be searched by keyword.

Accounting and Auditing, 4032
Administrators, 8540
Agriculturists, 5320
Air Transport, 8684
Analysis & Design,1364
Analysts, 7844
Animal Husbandry, 7104
Architects, 1212
Attendants/Operators & Amusement Support, 8548
Banking, 4124
Biologists, 5380
Broadcasting, 1296
Business & Finance, 1764
Cable Television, 1316
Chemical Engineering Technologists, 3832
Chemical/Petroleum/Rubber & Plastic Processing, 6244
Chemists, 7480
Civil and Structural Engineering Technologists, 3848
Clay/Glass & Stone Machining, 6276
Clay/Glass & Stone Processing,6296
Clerical Support, 4316
Coaches/Referees & Trainers, 8608
Commercial/Wholesale & Industrial,7980
Construction & Building, 1540
Construction - Electrical, 1624
Construction - Finishing, 1644
Construction - Management & Inspection, 1688

Dentists, 4548
Development, 1388
Direct Sales, 8036
Drafters, 2040
Educational Program Developers, 3336
Elections and Campaigns, 3432
Electrical & Electronic Engineering Technologists, 3892
Electrical & Electronic Fabrication & Assembly, 6316
Elementary Teachers, 2116
Engineering - Chemical, 3476
Engineering - Civil and Structural, 3516
Engineering - Electrical and Electronic, 3600
Engineering - Industrial and Manufacturing, 3664
Engineering - Mechanical, 3708
Engineering - Other, 3764
Farming, 7128
Fashion Designers, 1960
Fine Arts & Photography, 5588
Food & Beverage Processing, 6336
Food & Beverage Services, 8220
General Labourers, 5092
Geologists, 7564
Health Care Administrators and Educators, 4592
High School Students, 9040
Holistic Medicine, 4624
Horticulture, 7204
Human Resources, 1824
Ind. & Manufacturing Engineering Technologists, 3928
Information Systems, 1852
Installers/Repairers & Apprentices, 6916
Instructors, 8628
Insurance, 4168
Interior Designers, 1992
Investment and Finance, 4204
Journalism, 5648
Lawyers, 5144
Legal Secretaries, 5212
Libraries/Museums & Archives, 8308
Life Science Technicians, 5508
Logging, 7220
Lumber & Plywood Processing, 6376
Maintenance/Support & Operations, 1408
Management, 1468
Management Support, 5876
Management Trainees, 6012
Managers, 6060

Manufacturing & Processing Labourers, 5112
Mathematicians & Statisticians, 7880
Mechanical Engineering Technologists, 3960
Mechanics & Apprentices, 7020
Medical Support, 4648
Medical Technicians & Technologists, 4684
Metal Fabrication & Assembly, 6484
Metal Machining, 6524
Metal Processing - Iron & Steel, 6568
Metal Processing - Non-Ferrous, 6592
Metal Shaping & Forming , 6616
Mineral Ore Processing, 6676
Mining, 7308
Municipal Services, 4360
Nurses, 4768
Nursing Assistants, 4872
Office & Clerical, 7416
Offices/Hotels & Accommodations, 8348
Oil & Gas, 7332
Other Consultants, 1872
Other Designers, 2008
Other Engineering Technologists, 3992
Other Legal, 5284
Other Manufacturing, 6696
Other Teachers and Instructors, 3376
Parole & Probation Officers, 1008
Passenger Transport, 8760
Performing Arts/Audio & Visual Arts, 5696
Personal Services, 8396
Physical Science & Industrial Technicians, 7620
Physical Science Research Technicians, 7708

Physicians & Surgeons, 4888
Physicists, 7772
Plastic & Rubber Fabrication & Assembly, 6724
Plumbing & Gas Fitting, 1716
Post-Secondary Students, 9200
Printing, 5740
Protective Services, 8472
Psychologists, 1024
Pulp & Paper Fabrication & Assembly, 6744
Quality Assurance, 1516
Quality Control, 7900
Radio, 5776
Railway Transport, 8788
Real Estate, 4280

Reception & Telephone, 7460
Research & Design, 7916
Resource Support For Roads & Engineering, 7388
Retail, 8072
Retail Management Support, 8108
Retail Managers, 8136
Road Excavating/Grading & Paving, 1740
Sales Management Support, 8164
Secondary Teachers, 2140
Senior Management, 6192
Senior Managers and Administrators, 4404
Social Scientists, 1064
Social Workers & Counseling, 1116
Surveyors, 1236
Technicians & Planners, 1252
Telecommunications, 1332
Television/Video & Film, 5804
Textile/Fur & Leather Fabrication & Assembly, 6768
Textile/Fur & Leather Processing, 6812
Therapy & Dispensing, 5036
Training & Education, 1528
Transportation Services, 8812
Trucking, 8860
University & College Applied Sciences, 2228
University & College Architecture, 2240
University & College Engineering, 2252
University & College Fine Arts, 2352
University & College Humanities, 2376
University & College Languages &
University & College Medicine & Health Sciences, 2508
University & College Sciences, 2628
University & College Social Sciences, 2692
Unskilled Youth, 9064
Vocational Agriculture/Fisheries & Forestry, 2752
Vocational Animal Husbandry, 2772
Vocational Business & Administration, 2792
Vocational Computing, 2860
Vocational Construction & Industrial Trades, 2880
Vocational Engineering Technology, 2960
Vocational Equipment Operation, 3020
Vocational Food Preparation, 3036
Vocational Health Professions, 3052
Vocational Mechanics/Installation & Repair, 3164
Vocational Media Production and Graphic Arts, 3244 Vocational Personal Services, 3272
Vocational Science Technology, 3284
Vocational Social Services, 3304

Warehousing, 8916
Water Transport, 8972
Wood Fabrication & Assembly, 6852
Wood Machining, 6888

7.0 Monster.ca www.monster.ca

Monster.ca currently lists over 3000 Canadian jobs on its database according to the following job categories:

Accountin/financing banking
Administrative/clerical
Creative arts/media
Education/training
Engineering/architecture/design
Human resources
Information technology
Legal/ law enforcement/security
Marketing/advertising
Medical/ healthcare
Sales/ sales managment
Travel/ hospitality/ restaurant

8. Job Shark Www.jobshark.com

JobShark has developed a database which matches recruiters specific skill requirements to the actual skill levels of JobSeekers. This software informs skilled job seekers of matching positions.

At first glance, this might appear to be a system similar to ELE. However, a review of the Job Shark items revealed that they are similar to the skill/job lists provided in other internet recruitment systems. They would not be capable of producing the kind of skills information discussed in this study.

Appendix IV: Newspaper Advertisement-based Information

CareerClick

***Skills/occupational breakdown for CareerClick as follows*:**
Accountants
Administrative/Office Help
Building Mgrs
Childcare/Daycare
Computers/IT
Customer Service
Domestic/Home Care
Drama/Musical Talent
Driver Services
Employment Wanted
Engineering
Forestry/Mining/Fisheries
General Help
Health Medical/Dental Services
Hotel/Restaurant/Hospitality
Laborers/Warehouse
Oil/Gas
Professional/Management
Sales
Self Employment
Teachers/School Support
Temporary/Part-Time

Canada Employment Weekly http://www.mediacorp2.com/

This service uses the following occupational categories:

Accounting includes chartered accountants (CAs, CGAs, CMAs), controllers, comptrollers, auditors, cost accountants, tax specialists, accounting supervisors, bookkeepers and students in professional training programs. See also: "Finance", "Actuarial" and "Consulting".

Actuarial includes actuaries, statisticians, statistical process control (SPC) personnel, biostatisticians and other positions requiring actuarial or statistical training. See also: "Insurance" and "Quality Control".

Administrative includes executive assistants, office managers, secretarial staff, call centre personnel, data entry staff, receptionists, collection officers and clerks.

Advertising includes creative directors, advertising managers, media buyers, copy writers and advertising sales representatives. See also: "Public Relations", "Marketing", "Graphic Arts" and "Publishing".

Aerospace includes aerospace engineers, propulsion engineers, avionics technicians, aircraft maintenance engineers, simulator engineers, airworthiness inspectors, pilots and airline staff. See also: "Engineering", "Transport" and "Trades/Technicians".

Agriculture includes agricultural scientists, agronomists, veterinarians, crop insurance managers, feed sales personnel, farm equipment personnel and farm managers. See also: "Biotech" and "Scientific".

Apparel includes buyers, designers and marketers of clothing and footwear. See also: "Retail".

Architecture includes architects, architectural technologists, interior designers and structural technologists. See also: "Design", "Construction" and "Real Estate".

Arts includes anyone working for a museum, gallery, theatre company, orchestra or other cultural organization. See also: "Govt./Nonprofit".

Automotive includes automotive engineers, designers and technologists, tooling engineers, leasing managers, parts managers, service managers, warranty administrators and dealership staff. See also: "Transport" and "Engineering".

Banking includes anyone working for a bank, credit union or trust company, including branch managers, loan officers, mortgage specialists, private banking representatives, credit analysts, RRSP administrators and customer service representatives. See also: "Finance" and "Insurance".

Bilingual includes translators, interpreters and other positions where the ability to speak a second language is the principal requirement of the position. See also: "International".

Biotech includes biologists, biomedical engineers, biotechnology developers, biological scientists and other positions relating to the commercial development of biological, life sciences and genetic technologies. See also: "Scientific", "Pharmaceutical" and "Health/Medical".

Clergy includes chaplains, ministers, pastoral care workers and religious educators.

Computing includes programmers, analysts, software developers, hardware engineers, MIS directors, CIOs, LAN administrators, database administrators, technical writers, software testers, technical support personnel and other information technology positions. See also: "Multimedia", "Engineering", "Telecom" and "Design".

Construction includes project managers, site supervisors, surveyors, building inspectors, builders and other personnel required for construction projects. See also: "Real Estate" and "Trades/Technicians".

Consulting includes management consultants, policy advisors and personnel working for management consulting firms. Does not include consulting and contract positions in information technology, which are listed under "Computing". See also: "Management".

Design includes draftspersons, designers, product designers, circuit designers, electrical designers, mechanical designers, design technicians and technologist positions requiring specialized CAD and AUTOCad training. See also: "Architects", "Computing" and "Trades/Technicians".

Direct Mktng. includes direct mail managers, outbound call specialists, call centre supervisors, telemarketing staff and all positions that involve marketing by direct mail, telephone, fax or email. See also: "Sales", "Administrative" and "Marketing".

Disabled includes all positions working with physically or mentally challenged people. See also: "Health/Medical" and "Govt./Nonprofit".

Education includes teachers, principals, instructors, superintendents, school inspectors, professors, deans, education directors, ESL teachers, admission directors and administrative positions at schools, universities and colleges. Does not include training positions, which are listed under "Human Resource". See also: "Govt./Nonprofit" and "Human Resource".

Engineering includes electrical engineers, mechanical engineers, structural engineers, civil engineers, chemical engineers, engineering managers and other positions requiring a university engineering degree or membership in a provincial engineering association. Does not include engineering technologists and

non-university trained engineers (see "Trades/Technologists") or software engineers (see "Computing"). See also: "Aerospace", "Automotive", "Computing", "Geologists", "Oil & Gas", "Quality Control", "Telecom" and "Trades/Technicians".

Finance includes finance directors, controllers, CFOs, credit managers, treasurers, budget directors, financial analysts, investment bankers, investment advisors, economists, stockbrokers, traders, securities regulators, compliance officers, portfolio managers, mutual fund administrators and any position requiring a CFA or completion of a securities course. See also: "Accounting" and "Banking".

Forestry includes foresters, lumber traders, forest practices officers, arborists and other positions relating to tree planting, harvesting and sawmills. Does not include positions in papermaking, which are listed separately under "Pulp & Paper". See also: "Pulp & Paper".

Franchising includes franchise recruiters, territory managers and all other positions involved in developing new retail franchises. Does not include positions in franchisees' stores, which are listed separately under "Retail". See also: "Retail".

Geologists includes geologists, geophysicists, hydrogeologists, geodesists, geotechnical engineers, geological technicans and GIS mapping technicians. See also: "Engineering", "Mining", "Oil & Gas", "Scientific" and "Trades/Technicians".

Govt./Nonprofit includes deputy ministers, executive directors of nonprofit organizations, town administrators, city planners and other positions working for government bodies, charities or nonprofit organizations. Does not include healthcare positions, which are listed under "Health/Medical", or arts opportunities, which are listed under "Arts & Culture". See also: "Health/Medical" and "Arts & Culture".

Graphic Arts includes artists, graphic designers, creative directors, art directors, illustrators, Mac artists, prepress operators, imaging technicians and other positions requiring knowledge of graphic design software such as QuarkXpress, Photoshop, Illustrator or PageMaker. Does not include website designers, which are listed separately under "Multimedia". See also:"Advertising", "Publishing", "Multimedia", "Printing" and "Packaging".

Health/Medical includes nurses, therapists, medical doctors, health officers, hospital administrators, physiotherapists, rehabilitation counsellors, occupational therapists, kinesiologists, anaesthesiologists, ultrasound technicians, epidemiologists, dietitians, ophthalmologists, dentists, dental hygienists, pathologists, psychologists, psychiatrists, mental health workers, social workers, health data analysts, medical sales representatives, nursing assistants, medical technologists and medical secretaries. See also: "Pharmaceutical","Biotech" and "Government & Nonprofit".

Hospitality includes anyone working in the tourism, foodservice, entertainment or travel industries, including hotel managers, catering managers, film theater managers, travel agents, lodge and resort managers, chefs, food and beverage directors, nightclub managers and restaurant managers. See also: "Retail".

Human Resource includes human resource managers, personnel managers, compensation and benefits specialists, labour relations officers, HRIS specialists, pension administrators, payroll officers, career counsellors, outplacement consultants, employee development personnel, trainers, recruiters, executive search staff. See also: "Public Relations".

Insurance includes underwriters, adjusters, brokers, risk management professionals, treaty negotiators, claims supervisors, WCB claims personnel, investigators and insurance sales representatives. See also: "Actuarial."

International includes positions based outside Canada or requiring significant international experience, foreign language skills or travel outside Canada. See also: "Bilingual".

Law includes lawyers, prosecutors, general counsel positions, barristers and solicitors, judges, arbitrators, mediators, law professors, patent and trade mark agents, law office administrators, articling clerks, paralegals, legal secretaries, police officers and law enforcement personnel.

Librarians includes librarians, archivists and health record technicians.

Logistics includes material managers, distribution managers, inventory supervisors, traffic managers, material resource planning (MRP) specialists, production schedulers, supply chain managers, order administrators, customs brokers and warehouse supervisors. See also: "Purchasing", "Operations" and "Transport".

Management includes executive and managerial positions not otherwise classified including presidents, CEOs, managing directors, vice-presidents, general managers. Managerial positions in particular occupations are listed under the occupation (e.g. a Vice President of Marketing would be found under "Marketing" not "Management").

Marketing includes marketing managers, product managers, brand managers, marketing analysts, merchandisers, competitive analysts and market researchers. See also: "Sales", "Direct Mktng." and "Public Relations".

Metals includes metallurgists, metallurgical engineers, metal traders, foundry supervisors, metallurgical technologists, metal fabricators, sheet metal personnel and metal stamping staff. See also: "Mining" and "Trades/Technicians".

Mining includes mine superintendents, prospectors, underground shift bosses, mine inspectors and all positions requiring specialized knowledge of mines and minerals. See also: "Geologists", "Metals", "Oil & Gas" and "Trades/Technicians".

Multimedia includes web site designers, webmasters, Internet content developers, new media specialists, CD-ROM designers, HTML programmers and games programmers. See also: "Computing", "Graphic Arts" and "Publishing".

Oil & Gas includes exploration engineers, drilling engineers, reservoir engineers, pipeline engineers, petroleum chemists, crude oil marketing analysts, gas marketing specialists, oil and gas traders, gas plant personnel and wellhead operators. See also: "Geologists", "Engineering" and "Mining".

Operations includes plant managers, operations managers, production managers, manufacturing managers, shift supervisors, maintenance supervisors, line supervisors and production-related technologists. See also: "Logistics" and "Trades/Technicians".

Packaging includes positions in the packaging industry, including packaging engineers, label designers, packaging line supervisors, pressmen, label machine operators, box specialists and packaging technicians. See also: "Printing" and "Graphic Design".

Pharmaceutical includes pharmacists, pharmaceutical sales representatives, medicinal chemists, clinical trial administrators, toxicology study managers, clinical research associates, regulatory affairs specialists and drug approval officers. Does not include pure research positions (see "Scientific") or life science opportunities outside the drug industry (see "Biotech"). See also: "Biotech", "Scientific" and "Health/Medical".

Plastics includes all positions in the plastics industry, including plant managers, project engineers, line managers, injection molding managers, mold makers, fixture builders and plastics traders. See also: "Operations", "Engineering" and "Trades/Technicians".

Printing includes all positions in the printing industry, including plant managers, press operators, printing sales representatives and bindery operators. See also: "Publishing", "Graphic Arts", "Packaging" and

"Trades/Technicians".

Public Relations includes public relations officers, communications managers, media relations managers, public affairs managers, community relations officers, corporate writers and government affairs consultants. See also: "Advertising", "Marketing" and "Human Resource".

Publishing includes publishers, writers, editors, journalists, reporters, publication managers, editorial assistants, technical writers and copy writers. See also: "Graphic Arts", "Advertising" and "Printing".

Pulp & Paper includes all positions in the papermaking industry, including pulp mill managers, wood yard superintendents, pulp chemists, environmental compliance specialists, pulp line personnel, pulp sales representatives, pulp transport specialists, paper mill supervisors and paper sales personnel. See also: "Forestry", "Printing", "Engineering" and "Trades/Technicians".

Purchasing includes purchasing managers, buyers, purchasing agents, procurement managers, contract administrators, estimators, quotation administrators, commodity traders and any position requiring a Certified Professional Purchaser (CPP) designation or completion of the PMAC course. See also: "Logistics".

Quality Control includes quality engineers, quality auditors, statistical process control (SPC) coordinators, test engineers, reliability managers, quality assurance technicians, continuous improvement coordinators, testers and ISO 9000 inspectors. See also: "Operations", "Actuarial" and "Engineering".

Real Estate includes leasing managers, land development engineers, land administrators, facilities managers, landmen, real estate agents, brokers, new home sales representatives, rental agents, zoning inspectors, shopping mall managers, property managers, building maintenance managers, building security staff and space planners. See also: "Architecture" and "Construction".

Retail includes store managers, retail analysts, store planners, loss prevention specialists, assistant managers, management trainees and sales associates. See also: "Sales", "Hospitality" and "Franchising".

Sales includes sales managers, account executives, area supervisors, territory managers, sales representatives and customer service representatives. See also: "Marketing" and "Direct Mktng."

Scientific includes scientists, chemists, research associates, anthropologists, physicists, ecologists, regulatory affairs associates, laboratory managers and any position requiring a BSc, MSc or PhD in science. See also: "Biotech", "Pharmaceutical", "Health/Medical", "Geologists" and Agriculture".

Telecom includes network managers, telecommunications engineers, telephony analysts, switch technicians, network engineers, SONET software engineers, network support analysts, TCP/IP engineers and ATM/Frame Relay engineers. See also: "Engineering", "Computing" and "Trades/Technicians"

Trade Shows includes trade show managers, exhibit sales representatives, exposition staff and conference producers. See also:"Marketing" and "Hospitality".

Trades/Technicians includes millwrights, stationary engineers, mechanics, tool and die makers, electricians, welders, machinists and other skilled trades requiring an apprentice, journeyman or master tradesman designation. Also includes technologists and technicians. Does not include university-trained engineers, which are listed under "Engineering". See also: "Operations".

Transport includes transportation managers, transit planners, transport analysts, traffic study engineers, terminal managers, fleet managers, rail traffic coordinators, dispatchers, tractor-trailer drivers, coach drivers, ships pilots and AZ drivers. See also: "Logistics".

Globecareers.com www.globecareers.com.

Jobs are posted by the following job categories:

Administrative
Arts/humanities
Computer
Education
Engineering/science
Financial
Health/medical
Management
Marketing/sales
Other
Professional
Trades/service

In addition, the following industry classifications are used:

Agriculture
Appliance
Asbestos mines
Automotive
Banks
Biotechnology and pharmaceuticals
Breweries
Business form
Cable
Cement and concrete
Charity
Chartered accountants
Chemicals
Clothing and textiles
Clothing stores
Computer software and processing
consulting
Contractors
Credit unions
Department stores
developers
distilleries
east coast forestry
Education
Electrical and electronic
Electrical utilities
entertainment services
environmental services
finance and leasing
fishing
food processing
food services
food stores
gas pipelines
gas utilities
government
government agency
home furnishings

insurance-life
insurance-property and casualty
integrated mines
integrated oils
investment companies and funds
investment houses
leisure goods and services
library
lodging
machinery
management and diversified
medical services
metal fabricators
metal mines
mining services
misc. consumer products
mist. Industrial products
non-base metal mining
oils and gas field services
oil and gas producers
oil pipelines
other agricultural products
other mines
other services
packaging and containers
paper products
precious metals
property management and investment
publishing and printing
specialty stores
sports
steel
telecommunications
telephone utilities
tobacco
transportation equipment components
trust, savings and loan
west coast forestry
wholesale distributers
wineries

Appendix V: Recruitment Firms

A complete list of Canadian recruiting services can be found with the following sites: The Directory of Canadian Recruiters and the Canadian Directory of Search Firms.

The Directory of Canadian Recruiters www.gocontinental.com/candir.htm

The 1999 Directory of Canadian Recruiters includes full details on 2500 recruiting firms & locations indexed by industry, position and salary level specialties. The directory features:

- A Yellow Pages index chapter featuring 160 industry & position specialties. Determine which recruiters are hiring in specific industries or specific positions.
- A geographic area index locating recruiting companies in 18 areas in Canada.
- Type of firm (Management Consulting, Executive Search, Placement, Support Employment Agency, etc)
- Salary level of placements – all, >$30K only, >$50K only, >$75K only or >$100K only.
- Where placements are made – local/regional and/or national and/or international.

Canadian Directory of Search Firms www.mediacorp2.com/cdsf

The Canadian Directory of Search Firms (2nd Edition), published by Canada Employment Weekly provides comprehensive information on every major search firm in Canada. Substantially revised and updated for 1998, the directory now lists over 1,700 search firms and over 3,000 recruitment professionals across Canada.

The book is organized into six main sections:

The Firm Listings are arranged alphabetically and provide complete details on over 1,700 Canadian employers. Each listing provides information on how to get in touch with the search firm, including recruiter names, mailing addresses, telephone/fax numbers, email addresses and firm websites. Each listing also shows:

- the practice specialties of each firm -- over 70 occupations are listed;
- the seniority of employees typically recruited; and
- whether employers pay the search firm on a retainer or contingency basis.

The Occupational Index lists the firms by occupational specialty and location.
The Geographic Index lists the search firms by city and town for every province and territory of Canada.